

THURSDAY, DECEMBER 21, 1905.

## THE JAR AND THE GENIE.

*The Theory of Experimental Electricity.* By W. C. D. Whetham. Pp. xi+334. (Cambridge: The University Press, 1905.) Price 8s. net.

*Electric Railways: Theoretically and Practically Treated.* By S. W. Ashe and J. D. Keiley. Pp. 285. (New York: D. Van Nostrand Co.; London: Archibald Constable and Co., Ltd., 1905.) Price 10s. 6d. net.

*Modern Electric Practice.* Vol. vi. Edited by M. Maclean. Pp. vi+318. (London: The Gresham Publishing Co., 1905.) Price 9s. net.

THERE is a tale in the "Arabian Nights" of a fisherman who, after a day's ill luck, cast his net for the fourth and last time with a prayer to Allah that he might have a good haul. He drew to shore a copper jar of curious construction and mysteriously sealed, which on being opened was found to have confined a genie possessed of remarkable powers. As the genie proposed to reward his liberator by taking his life, the fisherman induced him to return into the jar, in which he again confined him. About two centuries ago the body of fishermen who called themselves then natural philosophers drew to shore from the sea of natural phenomena a similarly remarkable jar capable also of confining a very powerful genie. The discovery of the Leyden jar, we are told, "caused the greatest excitement in Europe and America," two continents which three years ago exchanged congratulatory messages across 2000 miles of ocean by means of Leyden-jar sparks. This, the most recent sensational demonstration of the powers of the genie, is by no means the most important; he has truly produced as great a revolution in the doings of mankind as any of his imaginary predecessors.

Ever since the genie has been released the fishermen have been divided into two camps; those who were most interested in studying the jar with the view of discovering the wonderful properties by which it could confine so powerful an agent, and those who have preferred to take such things for granted and have devoted themselves to putting these powers to the service of mankind. As time has advanced the work of each camp has become more and more differentiated, the "theorists" pressing always deeper and deeper into the region of first causes, but ever and again bringing to the surface some fresh discovery on which the "practical men" are quick to seize and which they soon adapt to useful purposes. Thus each continues to supplement the work of the other until it is hard to tell to which is owed the greater debt of gratitude—to those but for whom the powers of the genie would have remained concealed, or to those but for whom they would have remained discovered but unused.

Mr. Whetham's book is an admirable exposition of all that the theorists have discovered so far. "To some extent," he writes in the preface, "even a scientific text-book must be a piece of literature and a

work of art." "Experimental Electricity" can certainly claim to be both. The present writer does not profess to be very old, but the development of electrical theory has been so rapid since he first studied its elements that the text-books from which he learnt are more out of date than is Euclid as a text-book of modern geometry. An elementary text-book should give a comprehensive survey of the whole of its subject in such a way as to stimulate the curiosity and imagination of the student and this the book before us does. It is written in a clear and simple style, and the mathematics necessary are such as any student beginning his university career should have at hand. A very prominent and valuable feature of the book is the frequent reference to and quotation from the works of the founders of modern electrical theory, notably Faraday and Maxwell. The story which it tells of the development of this theory from the first suggestions of Faraday to the most recent conceptions of J. J. Thomson, Larmor, and others is one of extraordinary fascination and interest, and we cannot conceive any earnest student laying down the book without a desire to help to the best of his ability in solving the riddle with which it closes.

Books such as Mr. Whetham's should be read not only by the student who wishes to enrol himself in the scientific camp, but also by those who intend to become engineers. The engineer can never be the worse for a sound knowledge of what the men of science are doing. Incidentally he may be prevented from making some of the mistakes which Messrs. Ashe and Keiley make in the first chapter of their otherwise excellent book on electric railways. For example, these writers in the course of a few lines speak of the watt, first as power, then as work, and finally as energy. But after a few pages of this "miscallin' technicalities" they proceed to the more serious business of their book, and here there is little to which objection can be raised. The book is a good example of some of the feats that the genie has accomplished. It is a good example, too, of the extreme specialisation so characteristic now of all branches of electrical engineering. The title is somewhat broad, as the subject-matter is practically confined to rolling stock and rolling-stock equipment. The illustrations are plentiful and very clear.

If those who would learn what the jar is made of should study Mr. Whetham's book, those who would know in a general way the genie's powers should read "Modern Electric Practice," of which the present volume is the sixth and last. We have already reviewed the previous volumes and have pointed out what we consider to be somewhat serious defects in the plan and general arrangement of the work. Still, as a general summary of all the modern applications of electricity these volumes are not to be despised, especially when their very numerous illustrations are remembered. We would like to suggest that in future editions these are published without the text. The present volume contains very good articles on telegraphy and telephony; the article on electromedical appliances is disappointing in the extreme. There is in addition a good index to the whole six volumes.

The three books the titles of which head this review are typical of the three classes of men who have made the electrical industry. Mr. Whetham's of the seekers after truth who are always asking for more light and have discovered all the fundamental principles on which the industry is based, Messrs. Ashe and Keiley's of the pioneers who have developed the practical possibilities of these principles, and "Modern Electric Practice" of the great majority who are content to follow where others lead but whose united efforts have placed at the disposal of all mankind the forces latent in the philosopher's jar.

MAURICE SOLOMON.

#### HYGIENE AT SCHOOL.

*Text-book of Hygiene based on Physiology for the use of School Teachers.* By A. Watt Smyth. Pp. xvi + 256. (London: Simpkin, Marshall and Co., Ltd.) Price 6s.

MRS. WATT SMYTH rightly says in her preface that

"Physiology is the science of the action of the body in health, hygiene the practical application of this science; it is obviously impossible to understand the laws of hygiene without a knowledge of the fundamental principles of physiology."

She has set herself the task of providing a text-book of hygiene founded upon physiology, for the use of teachers, in order that they may comprehend the hygienic needs of the pupils committed to their charge. Hitherto the books written with this object (and there are several) have either been good as text-books of elementary physiology and bad as text-books of elementary hygiene, or *vice versa*; and Mrs. Watt Smyth is to be congratulated upon having brought these two subjects, which are so intimately associated with each other, into a fairly satisfactory relationship, and upon having dealt with each in a very commendable manner. It must be said, however, that the physiological matter of the book is the better, and that in many instances the hygienic matter could have been presented in greater fulness of detail with advantage. The space given to physiology far exceeds that devoted to hygiene, and while the demands of the former subject upon space are necessarily somewhat greater, there can be no two opinions that the physiology in many respects is too elaborate for the purpose to which this book is dedicated. Some non-essential matter is included; for instance, a description is given of the ethmoid bone, the number of bones it articulates with, and the time when ossification is complete; the number of separate centres of ossification is also given of other cranial bones; the minute structure of the salivary glands is entered into with unnecessary fulness, for the teacher is informed that

"the secreting cells of the salivary glands are of two main types, according as the secretion of the gland is mainly serous or albuminous (Parotid), mainly mucous (sub-lingual) or both (sub-maxillary). In a gland that has not been recently secreting, the mucous secreting cells, which are round or oval, are distended with a clear substance, mucigen, from which mucus is formed when the gland becomes

active. The cells of the glands which yield an albuminous secretion are cubical and almost fill up the acini. Their protoplasm is full of dark granules before secretion occurs; when it begins, the granules diminish in number and finally almost completely disappear."

These instances are referred to as illustrations of a certain lack of appreciation, which is evident here and there, of what is essential and what is not; for it is impossible to see what practical application can be claimed of the knowledge of the above facts. The illustrations and diagrams, moreover, are anatomical and histological. There is no single illustration of any form of sanitary apparatus or appliance, and these matters are referred to in the text often in such a cursory manner that the reader would find it impossible to form a satisfactory conception of their true nature.

Mrs. Watt Smyth deals with each subject on an excellent plan. First she gives a brief account of the physiology of the subject discussed (with special reference to any notable feature of these physiological processes in childhood), and then she proceeds to deal with the hygienic principles and practices which rest upon these foundations. Her scheme is well illustrated in the chapter on respiration and air; the nose, larynx, trachea, and lungs are first described, then the mechanism of respiration is explained, next the constitution of the air prior and subsequent to respiration is set out, and then there follows the consideration of the problems of ventilation and heating, and the evil consequences which result when these provisions are insufficient or faulty.

The other chapters of the book fairly cover the necessary ground, and the chapters upon the special senses and the muscular system (the latter including a syllabus of physical exercises based on the Swedish system) are very complete.

In conclusion, reference should be made to the great care which has been exercised in the preparation of this work. The facts set out are entirely accurate and the opinions expressed are sound, without exception. The author acknowledges her indebtedness for information and counsel from such authorities as Dr. Dawson Williams, Dr. James Kerr, and Miss Turner.

#### REGENERATION IN ROOTS.

*Studien über die Regeneration.* By Prof. B. Němec. Pp. 387; with 180 figures in the text. (Berlin: Gebr. Borntraeger, 1905.) Price 9.50 marks.

IN this somewhat bulky volume the author describes and discusses at some length the result of his numerous experiments on the regenerative processes that occur in wounded roots.

It is well known that if the tip be removed from a growing root a new apex is commonly differentiated, growth in length commencing once more when the new tip has become completely formed. The objects of Dr. Němec's investigation have been to endeavour to throw some light on the nature of the process of regeneration itself, the causes that initiate and determine its occurrence, and the meaning of the physiological events that are associated with it. The